6.1: Simple Interest

Definition.

The **simple interest** I is given by

$$I = Prt$$

where

I = interest (in dollars)

P = principal (in dollars)

r = annual interest rate (as a decimal)

t = time (in years)

Note: The time measurements of r and t must agree

From this, the **future value** of simple interest is

$$S = P + I = P + Prt = P(1 + rt)$$

Example.

If \$8,000 is invested for 2 years at an annual rate of 9%, how much interest will be received at the end of the 2-year period? What will the future value be?

$$P = $8,000$$

$$I = Prt = $000(0.09) z = $1440$$

$$t = 2 \text{ Yr}$$

$$r = 9\%/\text{Yr} = 0.09/\text{Yr}$$

$$S = P + I = $000 + 1440 = $19440$$

$$-07 - $5 = P(1+rt) = $000(1.18) = $19440$$

If \$4,000 is borrowed for 39 weeks at an annual interest rate of 15%, how much interest is due at the end of the 39 weeks?

$$P = $4,000$$

 $t = 39/52 \text{ yr}$
 $r = 15\%/\text{yr} = 0.15/\text{yr}$
 $T = Prt = 4000(0.15)\frac{39}{52} = 450

An investor wants to have \$20,000 in 9 months. If the best available simple interest rate is 6.05% per year, how much must be invested now?

$$S = $20,000$$

$$t = 9/12 \text{ yr} = \frac{3}{4} \text{ yr}$$

$$r = 6.65 \%/\text{yr} = 0.0605/\text{yr}$$

$$P = \frac{20000}{(1+0.0605(\frac{3}{4}))} = \frac{19,131.89}{(1+0.0605(\frac{3}{4}))}$$

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Definition.

The **return on investment** (ROI) is the ratio between the gain and cost of an investment:

$$ROI = \frac{\text{Gains on investment}}{\text{Cost of investment}}$$

The **earned (effective) interest rate** is the equivalent interest rate of the investment when all the fees and dividends are included.

Example. Mary Spaulding bought Wind-Gen Electric stock for \$6,125.00. After 6 months, the value of her shares had risen by \$138.00 and dividends totaling \$144.14 had been paid.

Find the return on investment on this investment.

$$POI = \frac{138.00 + 144.14}{6125.08} = 0.0461 = 4.61\%$$

Find the simple interest rate she earned on this investment if she sold the stock at the end of the 6 months.

$$T = 138.00 + 144.19$$

$$P = 6175$$

$$t = \%2 \text{ yr.} = \frac{1}{2} \text{ yr}$$

$$\frac{1}{(138 + 144.14)} = \frac{(125 r(\frac{1}{2}))}{(125(\frac{1}{2}))}$$

$$\frac{2(138+144,14)}{6125} = r = 0.0921$$

$$= 9.21\%$$

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Example.

To buy a Treasury bill (T-bill) that matures to \$10,000 in 6 months, you must pay \$9,750. What annual simple interest rate does this earn?

$$S = 10 000 = P + I =) I = 250$$

$$P = 9750$$

$$t = 6/12 \text{ Yr} = \frac{1}{2} \text{ Yr}$$

$$S = P + I = P + P_r t$$

$$I = P_r t$$

$$\frac{250}{9750(\frac{1}{2})} = \frac{9750(\frac{1}{2})}{9750(\frac{1}{2})}$$

$$\frac{2(250)}{9750} = r = 0.0513$$

$$= 5.13\%$$

If the bank charges a fee of \$40 to buy a T-bill, what is the actual interest rate you earn?

The \$40 15 removed from your gams

$$\Rightarrow S = 10 000 - 40 = P + I \Rightarrow I = 210$$

$$P = 9750$$

$$t = 6/12 \text{ Yr} = \frac{1}{2} \text{ Yr}$$

$$\frac{210}{9750(\frac{1}{2})} = \frac{9750(\frac{1}{2})}{9750(\frac{1}{2})}$$

$$\frac{2(210)}{9750} = r = 0.043$$

$$= 4.31\%$$

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